# CS 201 Homework 01
# CHANGEME: CS201 Homework 01

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Source Code Link: `https://github.com/StefanoFochesatto/cs201/tree/master/Homeworks/HW1`

This homework took approximately 02 hours to complete.

## 1 Design

For the main program we want to use nested for loops, we want to print things vertically and horizontally. So first the program asks for how many rows the diamond has since that's what decides our size. From a programming standpoint there are 2 main sections, the top half and the bottom half of the diamond. Each section is then comprised of hashes and spaces. Each main section has two loops inside, one that prints spaces and one that prints hashes. The top half section subtracts a space with each loop and the bottom half adds a space with each loop.

## 2 Post Mortem

The biggest thing I can take away from the main diamond program is to really take the time to write out what each variable means when programming iteration. I spent a lot of time just wrapping my brain around how to set up all the variables in my loops. I definitely could have figured something out a lot faster if

I had put pen to paper and sorted it out beforehand. One thing that I found was helpful was to make sure that the variables in the conditional statement of loops are outside of the loop itself. There was a large stretch of time where I had ”spaces++” inside of the loop that had a conditional statement based on the spaces variable!!

# 3 Answers to Questions

In this section, you will write the answers to the questions in the homework assignment.

- What is the purpose of the compiler? What are the stages form source code to executable?
  The purpose of a compiler is to convert high level programming language such as c++, java and python in to low level language like assembly or machine code. There are four stages from source code to executable, first the source code goes through a pre-processor and then a compiler. The compiler turns the code into assembly language, which then goes through an assembler turning that assembly language into a binary object file. Finally the object file goes through a linker which serves to link object files to together to create one versatile executable.

- What is meant by the terms header, compiler-time error, linker, and statements?
  A compile time error is an error that is detected by the compiler which means that the program can’t be compiled successfully until the error is corrected. A linker takes one or more object files and groups them together into a new file. A statement is the smallest unit of programming language that expresses some action to be carried out. A header file contains declarations of standard input and output functions.

- What is the difference between a source file and an object file?
  A source file is written in high level programming language, and is meant to run through a compiler. It is the first step towards creating an executable. An object file is essentially what comes out of the compiler. Its a file written in lower level language like machine code or assembly.

- If you understand everything in the textbook, why is it necessary to practice?
  Programming is not an entirely intellectual activity, it's physical and interactive and the only way to actually gain proficiency in things like that is through focused, long term practice.

- What is meant by the term prompt?
  A message that ”prompts” the user for information. Consider a string that print out, ”What is your name?”.

- What is ”\n” called, and what purpose does it serve?
  \n Is the newline character, and it serves to end the current line. Its different from endl because that is essentially a function.

- What is a variable? What is an object? What is a literal?
  Consider $intx = 3;$, $x$ is the variable, $3$ is the literal and $int$ is the object.

- What kind of literals are there?
  There are 5 types of literals in c++, integers, floating points, booleans, characters, and strings.

- Give five example of legal names that you shouldn't use because they are likely to cause confusion?

Consider, string, int, float, char, and bool.

- Why can a conversion from a double to an int be a bad thing? Because you are losing information, with c++ it truncates by default so every float gets rounded down to the nearest integer value. If there is a need to convert a float to an int it is important to specify floor ceiling functions.

## 4 Sample Output

Listing 1: Sample Program Output

```
How big do you want your diamond?: 5
    #
   ###
  #####
 #######
#########
 #######
  #####
   ###
    #
Program ended with exit code: 0
```

## 5 Diamond

```
#include <iostream>

int main(int argc, const char * argv[]) {
    std::cout << "How big do you want your diamond?: ";
    int lines_in_diamond;

    std::cin >>lines_in_diamond;
    int space = lines_in_diamond-1;


    for (int k=1; k<=lines_in_diamond; k++)//Top-half Diamond Parent Loop
    {
        for(int j=1; j<=space; j++)//Top-half Diamond Spaces Loop
        {
            std::cout<<" ";
        }
        space--;
        //Since there is one less space in the next row. Eventually this will go to


        for(int j=1; j<=(2*k-1); j++)//Top-half Diamond Hashes Loop
        {
            std::cout<<"#";
        }
        std::cout<<"\n";
        //We need a line break to go into the next row of the diamond.
    }



    space=1; //Before we start the loop for the bottom half of the diamond we need t



    for(int k=1; k<=(lines_in_diamond-1); k++)//Bottom-half Diamond Parent Loop. (li
    {
        for(int j=1; j<=space; j++)//Bottom-half Diamond Spaces Loop
        {
            std::cout<<" ";
        }
        space++;//We need to add the spaces back
        for(int j=1 ; j<=(2*(lines_in_diamond-k)-1); j++)//Bottom-half Hashes Spaces
        {
            std::cout<<"#";
        }
        std::cout<<"\n";
    }
    return 0;
}
```

## 6 Sample Output: Greatest Integer

Listing 2: Sample Program Output

```
Enter a sequence of positive integers, ending with
   zero.
I will print the greatest positive number entered.
Enter a positive integer (0 to end): 2
Enter a positive integer (0 to end): 3
Enter a positive integer (0 to end): 1
Enter a positive integer (0 to end): 7
Enter a positive integer (0 to end): 0
The greatest number entered:7
Program ended with exit code: 0
```

## 7 Greatest Integer

```cpp
#include <iostream>
#include <vector>
#include <algorithm>
int main(int argc, const char * argv[]) {
    std::cout << "Enter a sequence of positive integers, ending with zero.\nI will p

    bool run=true;//This is the boolean for the do while loop. gotta keep the progra

    std::vector<int> arr;//Here we want to intialize a vector to store user inputs.


    do{
        std::cout << "Enter a positive integer (0 to end): ";
        int user_input;
        std::cin >> user_input;

        if (user_input>0){
            arr.push_back(user_input);// adds user_input to vector.
        }
        else{
            run=false;
        }
         std::sort(arr.begin(), arr.end());//We use sort() to sort the element in th
    }
    while(run==true);

    if (arr.empty()){
        //if statement for when vector is has no elements
        std::cout <<"No posistive integers were entered!!"<< std::endl;
        }
    else{
        int n = (uint32_t)arr.size();//We need to find the size of the vector and th
        std::cout <<"The greatest number entered:"<< arr[n - 1] << std::endl;// We d
    }
    return 0;
}
```

## 8 Sample Output: mileskm

Listing 3: Sample Program Output

```
Please enter how many miles?
44.2
44.2 miles in kilometers is 71.1178
Program ended with exit code: 0
```

# 9 mileskm

```cpp
#include <iostream>

int main(int argc, const char * argv[]) {
    std::cout << "Please enter how many miles?\n";
    float miles;
    std::cin >> miles;
    std::cout << miles<< " miles in kilometers is " << miles*1.609<< std::endl;

    return 0;
}
```